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09/775,106	02/01/2001	Gerard A. Mourou	UMJ-939-R	4544

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EXAMINER

EVANS, GEOFFREY S

ART UNIT PAPER NUMBER

1725

DATE MAILED: 05/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/775,106

Applicant(s)

MOUROU ET AL.

Examiner

Geoffrey S Evans

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 46-80 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 46-80 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other:

### DETAILED ACTION

1. The cross-reference to related Applications should also be amended to refer to the original patent U.S. 5,656,186.

2. In response to the PROTEST of June 29,2003, in general it is not persuasive. The phrase "directing the beam to the material" has support in figures 1 and 6A. Clearly the beam cannot be focused on or beneath the workpiece without directing the laser beam to the workpiece. The Protestor's further argument that "focusing said beam to a point at or beneath the surface of the material" is an essential element of the invention is incorrect. In contrast, the specification clearly describes to one of ordinary skill in the art that it is not the degree of focus that causes ablation, it is the fluence (Joules/cm<sup>2</sup>) level that controls ablation for a given pulse width (see column 5, lines 60-65 and column 6, lines 1-3 of Mourou et al. in U.S. Patent No. 5,656,186, in which the area of fluence is smaller than the beam spot size, i.e. focus). Mourou et al. in U.S. Patent No. 5,656,186 further describes in column 6, lines 42-49 alternative configurations for practicing the invention in which not all of the descriptions require focusing the beam. Since Mourou et al. refers in column 4 of the specification to previous U.S. Patent No. 5,235,606 (in which femtosecond pulses are emitted with an energy of up to 15 Joules), it is within the level of ordinary skill in the art at the time the invention was made to use a laser cavity designed to emit a collimated beam with a fluence of at least 1-5 J/cm<sup>2</sup> to practice the instant invention without focusing the beam after it exits the laser cavity. However, regarding claims 56,60,61,79, and 80 recitation of focusing to a point at or beneath the surface of the material is an essential element of the invention since to direct the beam

so it is beneath the surface of the workpiece is only supported sufficiently in the originally filed specification by focusing the laser beam beneath the surface of the material and regarding claims 57 and 67, for a "Rayleigh range" to exist the beam must be focused.

3. In accordance with 37 CFR 1.175(b)(1), a supplemental reissue oath/declaration under 37 CFR 1.175(b)(1) must be received before this reissue application can be allowed.

Claims 46-80 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251. See 37 CFR 1.175. The nature of the defect is set forth above in the first paragraph of this office action.

Receipt of an appropriate supplemental oath/declaration under 37 CFR 1.175(b)(1) will overcome this rejection under 35 U.S.C. 251. An example of acceptable language to be used in the supplemental oath/declaration is as follows:

"Every error in the patent which was corrected in the present reissue application, and is not covered by a prior oath/declaration submitted in this application, arose without any deceptive intention on the part of the applicant."

4. Claim 52 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no support in U.S. Patent No. 5,656,186 that the material being machined is a semiconductor as recited in claim 52. Applicant cannot successfully argue that Applicant by contemplating the genus of all materials for the process entitles Applicant to now claim the species of semiconductors for use in the

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process. See Ex Parte Klager, 132 USPQ 206,207 "... as a matter of law, an applicant cannot include and claim a specific thing not originally described, merely because it comes within the scope of the genus before disclosed."

5. Claims 56,57,60,61, 79,80 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In claims 56,79,80 there is no disclosure of focusing the beam, but that is the only method disclosed in U.S. Patent No. 5,656,186 for directing the beam "beneath the surface of the metal". Similarly, claims 57 and 67 recite a "Rayleigh range" that requires a focused beam to be present.

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

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Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 46,48,49,50,51/46,51/48,51/49,51/50,52/46,52/48,52/49,52/50, 55/46,55/48,55/49,55/50,57/46, 57/48,57/49,57/50,58/46,58/48, 58/49,58/50,61/56/46, 61/55/48,61/56/49, 61/56/50,62/55/46,62/55/48,62/55/49,62/55/50,63/46, 63/48,63/49, 63/50,69/46,69/48,69/49,69/50,70/46,70/48,70/49,70/50,71/46,71/48,71/49,71/50,72/46, 72/48,72/49,72/50,73/46,73/48,73/49,73/50 and 78 are rejected under 35 U.S.C. 102(b) as being anticipated by Ihlemann et al. in the article "Nanosecond and Femtosecond Excimer Laser Ablation of Fused Silica". Ihlemann et al. discloses as shown in figure 1 laser ablation of a transparent dielectric material ( $\text{SiO}_2$ ) by making holes with pulses of 500 femtoseconds duration, which is far less than a pulse width of 10 picoseconds which is disclosed as the point at which the machining is essentially accurate with this material. Since Ihlemann et al. discloses a pulse width shorter than 10 picoseconds inherently under Applicant's discovered law of nature (the log-log relationship between fluence threshold at which breakdown occurs versus laser pulse width, the relationship exhibiting a distinct change in slope with respect to decreasing pulse width to a nearly constant value) the laser pulse ablation of Ihlemann et al. must also be subject to the same law of nature. See EMI Group North America Inc. v. Cypress Semiconductor Corp., 60 USPQ 1423,1430 (CAFC 2001) which states "Recitation of a law of nature does not distinguish a claim from prior art. Funk Bros Seed Co. V. Kalo Inoculant Co., 333 U.S. 127,130 (1948) ("[M]anifestations of laws of nature [are] free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of

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nature has no claim to monopoly of it which the law recognizes."'). Similarly, Ihlemann et al.'s pulse width must be below the pulse width at which the laser induced breakdown becomes essentially accurate and the point at which the size of the feature is not limited by thermal diffusion and the pulse width of Ihlemann et al. is sufficiently short that the affected area is substantially determined solely by the beam shape and fluence in relation to the threshold for laser induced breakdown.

1. Claims 46,48-50,51/46,51/48,51/49,51/50,52/46,52/48, 52/49, 52/50, 55/46,55/48,55/49,55/50, 57/46,57/48,57/49, 57/50, 58/57/46, 58/57/48,58/57/49, 58/57/50,62/46,62/48,62/49,62/50, 63/46,63/48,63/49,63/50, 65/46,65/48,65/49,65/50, 68/46,68/48,68/49,68/50, 69/46,69/48,69/49,69/50,70/46,70/48,70/49,70/50, 71/46, 71/48,71/49,71/50, 72/46,72/48,72/49,72/50, 73/46,73/48,73/49,73/50 and 78 are rejected under 35 U.S.C. 102(e) as being anticipated by Alexander in U.S. Patent No. 6,489,589 B1. The Alexander reference, which has an effective filing date of February 7, 1994, discloses (see column 9, line 63 to column 10, line 38) laser machining stainless steel, gold, copper, iron, nickel, titanium, silicon, and diamond (which is a transparent material) using pulses with a width of 150 femtoseconds duration, which is far less than a pulse width of 10 picoseconds which is disclosed by the instant application as the point at which machining is essentially accurate with this material. Since Alexander discloses a pulse width shorter than 10 picoseconds inherently under Applicant's discovered law of nature (the log-log relationship between fluence threshold at which breakdown occurs versus laser pulse width, the relationship exhibiting a distinct change in slope with respect to decreasing pulse width to a nearly constant value) the laser

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pulse ablation of Alexander must also be subject to the same law of nature. See EMI Group North America Inc. v. Cypress Semiconductor Corp., 60 USPQ 1423, 1430 (CAFC 2001) which states "Recitation of a law of nature does not distinguish a claim from prior art. Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948) ("[M]anifestations of laws of nature [are] free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to monopoly of it which the law recognizes.")". Similarly, Alexander's pulse width must be below the pulse width at which the laser induced breakdown becomes essentially accurate and the point at which the size of the feature is not limited by thermal diffusion and the pulse width of Ihlemann et al. is sufficiently short that the affected area is substantially determined solely by the beam shape and fluence in relation to the threshold for laser induced breakdown.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to



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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 47, 51/47, 52/47, 55/47, 56, 59, 60, 61, 58/47, 62/55/47, 63/47, 65/47, 66/47, 69/47, 70/47, 71/47, 72/47, 73/47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ihlemann et al. in view of Lai in U.S. Patent No. 5,984,916. Ihlemann et al. discloses as shown in figure 1 laser ablation of a transparent material ( $\text{SiO}_2$ ) by making holes with pulses of 500 femtoseconds duration. Lai as shown in figure 5 teaches creating an interaction zone that is smaller than the wavelength of the laser beam beneath the surface of the workpiece. It would have been obvious to adapt Ihlemann et al. in view of Lai to provide this to decrease the size of the part of the workpiece that has material properties change.

5. Claims 64/46, 64/48, 64/49, and 64/50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ihlemann et al. in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. teaches generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would have been obvious to adapt Ihlemann et al. in view of Mourou et al. to provide this to create a short high peak power pulse.

6. Claim 64/47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ihlemann et al. in view of Lai in U.S. Patent No. 5,984,916 as applied to claim 47 above, and further in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. teaches generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would have been obvious to adapt

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Ihlemann et al. in view of Lai and Mourou et al. to provide this to create a short high peak power pulse.

7. Claims 65/46,65/48,65/49,65/50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ihlemann et al. in view of Stuke et al. in U.S. Patent No. 5,243,589. Stuke et al. teaches machining with femtosecond laser pulses by scanning a laser beam relative to a workpiece by moving the workpiece (e.g. see column 2, lines 35-37). It would have been obvious to adapt Ihlemann et al. in view of Stuke et al. to form a groove or textured surface along the workpiece surface.

8. Claims 47,51/47,52/47,55/47,56,57/47,57/47,58/47,59,60,61,62/47,63/47, 65/47, 66, 68/47,69/47,70/47, 71/47, 72/47,73/47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in U.S. Patent No. 6,489,589 B1 in view of Lai in U.S. Patent No. 5,984,916. Lai as shown in figure 5 teaches creating an interaction zone that is smaller than the wavelength of the laser beam beneath the surface of the workpiece. It would have been obvious to adapt Alexander in view of Lai et al. to provide this to decrease the size of the part of the workpiece that has material properties change.

9. Claims 64/46,64/48,64/49, and 64/50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. teaches generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would

have been obvious to adapt Alexander in view of Mourou et al. to provide this to create a short high peak power pulse.

10. Claim 64/47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Lai as applied to claim 47 above, and further in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. teaches generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would have been obvious to adapt Alexander in view of Lai et al. and Mourou et al. to provide this to create a short high peak power pulse.

11. Claims 53/52/46, 53/52/48, 53/53/49, 53/52/50, 54/53/52/46, 54/53/52/48, 54/53/52/49, 54/53/52/50, 79 and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Wojnarowski et al. in U.S. Patent No. 5,104,480. Wojnarowski et al. teaches laser machining gold (see column 7, line 19) above a substrate of glass (see column 6, line 64) to create a conductive pattern for an integrated circuit. It would have been obvious to adapt Alexander in view of Wojnarowski et al. to provide this to create an integrated circuit on the substrate.

12. Claims 53/52/47, 54/53/52/47, 68/47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Lai in U.S. Patent No. 5,984,916 as applied to claim 47 above, and further in view of Wojnarowski et al. in U.S. Patent No. 5,104,480. Wojnarowski et al. teaches laser machining gold (see column 7, line 19) above a substrate of glass (see column 6, line 64) to create a conductive pattern for an integrated circuit. It would have been obvious to adapt Alexander in view of Lai et al. and Wojnarowski et al. to provide this to create an integrated circuit on the substrate.

13. Claims 67 and 74-77 patentably define over the art of record but are rejected under 35 U.S.C. 251 as stated above.

14. Applicant's arguments filed October 24, 2003 have been fully considered but they are not persuasive. The interview of 19 October 2000 is not controlling with regard to this reissue application. The instant reissue application is not a reissue of RE 37,585, but of U.S. Patent No. 5,656,186. Applicant's citing of case law (e.g. Ethicon Endo-Surgery, Inc. v. United States Surgical Corp. 93 F.3d 1571 n.7, 40 U.S.P.Q. 2d 1019 (Fed. Cir. 1996)) for the proposition that a patent owner may assert claims which go beyond the specific embodiment shown in his or her application is not persuasive in this application. There is not even a word in the specification mentioning that the material can be made of a semiconductor. The case cited in the last office action (Ex Parte Klager, 132 USPQ 206) directly addresses the issue of whether disclosure of a genus allows the subsequent claiming of a species. Applicant has cited no case law that that specifically contradicts or overrules this case law. The affidavit of Dr. Peter Pronko is by a person of very high skill and the art, not one of ordinary skill in the art. Furthermore, his technical affidavit cannot overcome the case law of Ex Parte Klager, 132 USPQ 206. Applicant further argues that the Ihlemann rejection "assumes that the fluence/pulse width relationship with respect to decreasing pulse width is to a nearly constant value." No support for this argument is found in the rejection. As shown in figure 8 of U.S. Patent No. 5,656,186, and described in column 7, line 57 to column 7, line 67, when the pulse width becomes shorter than a few picoseconds, a large increase in damage threshold accuracy is observed. Since Ihlemann et al. discloses

using laser pulse widths of 500 femtoseconds (i.e. 0.5 picoseconds) for machining SiO<sub>2</sub>, the laser induced breakdown must be essentially accurate. There is no requirement that Ihlemann et al. must recognize the relationship between the pulse width and fluence since this is a law of nature, which depends upon the particular material. See EMI Group North America Inc. v. Cypress Semiconductor Corp., 60 USPQ 1423,1430 (CAFC 2001) which states "Recitation of a law of nature does not distinguish a claim from prior art. Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127,130 (1948) ("[M]anifestations of laws of nature [are] free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to monopoly of it which the law recognizes.")". Similarly, Applicant's arguments regarding the Alexander reference are not persuasive. While Applicant is correct that Alexander does not provide three different data points of pulse width versus fluence, this is not required to meet the claims since Alexander discloses laser machining with a pulse width below the width at which the laser machining becomes essentially accurate. Applicant further argues that one would not be motivated to adapt Ihlemann in view of Lai since they are treating different materials. However since this is an issue of a common problem (the desirability of minimizing the area effected by the laser beam), they are considered to be analogous prior art.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey S Evans whose telephone number is (571)-272-1174. The examiner can normally be reached on Mon-Fri 6:30AM to 4:00 PM, alternate Fridays off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (571)-272-1171. The fax phone number for the organization where this application or proceeding is assigned is (703)-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571)-272-1300.



Geoffrey S Evans  
Primary Examiner  
Art Unit 1725

GSE  
January 15, 2004